

PATENT ABSTRACTS OF JAPAN

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(54) SYNTHETIC RESIN COMPOSITION WITH IMPROVED FLAME RETARDANCE

(57)Abstract:

PURPOSE: To prepare a synthetic resin compsn. which has an improved flame retardance, generates a reduced amt. of smoke, and allows no dripping to occur by compounding a synthetic resin with a resorcinol

polyphosphate compd. and a zinc salt of an inorg. acid.

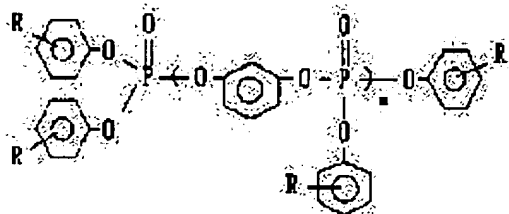
CONSTITUTION: A synthetic resin compsn. is prepd. by compounding 100 pts.wt. synthetic resin with 0.1-30 pts.wt. resorcinol polyphosphate compd. of the formula

(wherein R is H or CH₃; and n is 1-5) and 0.01-15 pts.wt.

zinc salt of an inorg. acid (e.g. zinc borate). The compsn.

not only has an improved flame retardance but also

generates a reduced amt. of smoke and allows no dripping to occur.



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2. **** shows the word which can not be translated.
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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[Industrial Application] This invention relates to the synthetic-resin constituent with which fire retardancy has been improved by adding a resorcinol poly phosphate compound and the zinc salt of an inorganic acid in detail about the synthetic-resin constituent with which fire retardancy has been improved.

[0001]

[Description of the Prior Art] Since synthetic resin, such as polyvinyl chloride resin, polyolefin resin, styrene resin, and polycarbonate resin, has the outstanding physical property, it is used for various applications, such as autoparts, a device for electrical and electric equipment, a upholstery, a building material, and other various casts. However, since these synthetic resin is inflammability, various legal restrictions are received depending on an application, and advanced fire retardancy is demanded also from the fire retarding material.

[0002] To the fire-resistant demand of this synthetic resin, the approach of adding flame retarders, such as various kinds of multi-chlorination organic compounds, a multi-bromination organic compound, an antimony trioxide, and phosphorus compounds, etc. has been proposed.

[0003] However, since the halogen-containing flame retarder is unstable and it is easy to decompose it to an elevated temperature, the phenomenon colored at the time of processing appears, and the phenomenon of the synthetic resin containing a halogen-containing flame retarder is remarkable especially at the time of hot working.

[0004] Moreover, as phosphorus compounds, an aromatic series phosphate compound (JP,48-38768,B), bisphenol A-poly phosphate, and hydroquinone screw phosphate compound (JP,55-118957,A) resorcinol poly phosphate compounds (JP,63-65109,B, JP,2-25381,B, etc.) are indicated. However, if, in order to close flameproofing of synthetic resin with these phosphorus compounds, comparatively a lot of addition was needed, therefore there was a fault, like heat deflection temperature not only falls remarkably, but often causes a dropping phenomenon.

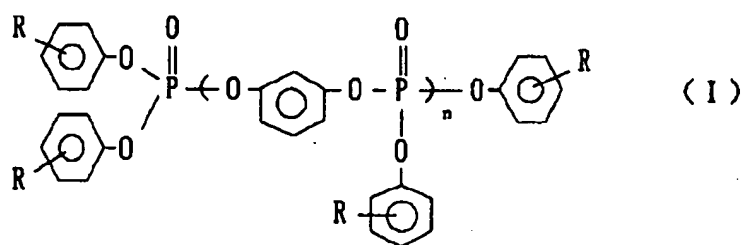
[0005]

[Means for Solving the Problem] this invention person etc. reached header this invention in the synthetic-resin constituent which does not cause a dropping phenomenon while demonstrating the remarkable flameproofing effectiveness by adding a certain specific resorcinol poly phosphate compound and zinc salt of an inorganic acid to synthetic resin, as a result of repeating examination wholeheartedly in view of the above-mentioned present condition.

[0006] That is, this invention offers the synthetic-resin constituent with which the fire retardancy which comes to add the zinc salt 0.01 of the resorcinol poly phosphate compound 0.1 - 30 weight sections which are expressed with the general formula (I) of the next [-izing 2] (it is the same as [-izing 1]), and (a) (b) inorganic acid - 15 weight sections in the synthetic-resin 100 weight section has been improved.

[0007]

[Formula 2]



(R shows a hydrogen atom or a methyl group among a formula, and n shows 1-5.)

[0008] Hereafter, the synthetic-resin constituent with which the fire retardancy of this invention has been improved is explained in full detail.

[0009] As synthetic resin set as the object of the fire-resistant improvement in the synthetic-resin constituent of this invention For example, high density, a low consistency or straight chain-like low density polyethylene, polypropylene, The random copolymer or block copolymer of alpha olefin polymers, such as polybutene -1, a Polly 3-methyl pentene, and poly4 methyl 1 pentene, or an ethylene-propylene, An ethylene-propylene-diene copolymer, ethylene and a 4-methyl-1-pentene copolymer, The copolymer of alpha olefins, such as an ethylene-vinylacetate copolymer, a polyvinyl chloride, A polyvinylidene chloride, chlorinated polyethylene, chlorination polypropylene, Chlorinated rubber, a vinyl chloride vinyl acetate copolymer, a vinyl chloride-ethylene copolymer, A vinyl chloride-vinylidene-chloride-vinyl acetate ternary polymerization object, a vinyl chloride-maleate copolymer, Halogen-containing resin, such as a vinyl chloride-cyclohexyl maleimide copolymer, Petroleum resin, cumarone resin, polystyrene, polyvinyl acetate, acrylic resin, Styrene and/or alpha methyl styrene, and other monomers for example, a maleic anhydride, phenyl maleimide, and a methyl methacrylate -- a copolymer (for example, an AS resin --) with a butadiene, acrylonitrile, etc. Polymethacrylates, such as ABS plastics, MBS resin, and heat-resistant ABS plastics, Polyvinyl alcohol, a polyvinyl formal, a polyvinyl butyral, Straight chain polyester resin, such as polyethylene terephthalate and polytetramethylene terephthalate, Polyamides, such as polyphenylene oxide, the poly caprolactam, and a polyhexamethylene AJIPO amide, A polycarbonate, polyacetal, polyphenylene sulfide, Thermosetting resin, such as thermoplastic synthetic resin, such as polyurethane and fibrin system resin, and these blend objects or a polymer alloy, phenol resin, a urea resin, melamine resin, an epoxy resin, and an unsaturated polyester resin, can be raised. Moreover, you may be elastomers, such as polyisoprene rubber, butadiene rubber, acrylonitrile-butadiene copolymerization rubber, and styrene butadiene rubber.

[0010] the addition of the resorcinol poly phosphate compound expressed with the above-mentioned general formula (I) which is the (a) component of the synthetic-resin constituent of this invention -- the synthetic-resin 100 weight section -- receiving -- 0.1 - 30 weight section -- it is 1 - 15 weight section preferably.

[0011] Moreover, in the synthetic-resin constituent of this invention, as an inorganic acid which constitutes the zinc salt of the inorganic acid which is the (b) component which uses together with the resorcinol poly phosphate expressed with the above-mentioned general formula (I), and is added, boric acid, a phosphoric acid, an orthochromatic phosphoric acid, a pyrophosphoric acid, a stannic acid, a silicic acid, carbonic acid, zirronic acid, a molybdic acid, a tungstic acid, etc. are raised, and especially the zinc salt of boric acid and a stannic acid is used preferably, for example.

[0012] As zinc salt of the above-mentioned inorganic acid, although a commercial item may be used as it is, using what ground further and made grain size fine has large effectiveness, and it is desirable.

[0013] the addition of the zinc salt of the above-mentioned inorganic acid -- the synthetic-resin 100 weight section -- receiving -- 0.01 - 15 weight section -- it is 1 - 10 weight section preferably.

[0014] In the synthetic-resin constituent of this invention, heat-resistant improvement agents, such as resin modifiers, such as an ultraviolet ray absorbent of anti-oxidants, such as a phenol system, the Lynn system, and a sulfur system, a benzophenone system, a benzotriazol system, a SARISHI rate system, and a cyanoacrylate system, a hindered amine light stabiliser, a heavy-metal deactivator, a nucleating

agent, and lubricant, a hydrotalcite, and a zeolite, other flame retarders, a bulking agent, a coloring agent, a thermostabilizer, a plasticizer, an antistatic agent, an antifungal agent, etc. may be added suitably if needed.

[0015] The fire-resistant synthetic-resin constituent of this invention can process a predetermined component by the usual approaches, such as a roll mill, a kneader, a Banbury mixer, an extruder, and an injection molding machine.

[0016] The fire-resistant synthetic-resin constituent of this invention has the various advantages and descriptions which were mentioned above, and a still more extensive application is expected. A new application can be offered from it excelling especially in fire retardancy, and there being no combustion dropping object.

[0017]

[Example] Hereafter, although an example explains the synthetic-resin constituent of this invention, this invention is not limited to these examples.

[0018] [Example 1] After carrying out the dryblend of the compound of the next <combination>, it dried at 80 degrees C for 6 hours. Subsequently, 220 degrees C of cylinder temperatures and rotational frequency 200rpm The pellet was created using the twin-screw extruder and it dried at 80 degrees C again for 6 hours. The test piece with a thickness of 2mm was created with the 220-degree C injection molding machine using this pellet.

[0019] Fire-resistant evaluation was performed according to the examining method specified to UL-94, the time amount from the first ignition to resolution was respectively measured to the test piece of five sheets, and the average was calculated. Moreover, heat deflection temperature is ASTM. It measured according to D-648. The result is shown in following [table 1].

[0020]

< ** **> Weight section High impact polystyrene (diamond REXX H-88) 100 Poly phosphate compound (refer to [Table 1]) 10 Zinc borate (ADEKA stub 2335) * 5 stearyl (3) [5-JI tertiary butyl-4-HIDOROKI] 0.2 SHIFENIRU propionate Distearylpentaerythritoldiphosphite 0.2 Ethylene screw (stearyl amide) 0.2 * : Asahi Denka Kogyo make (2ZnO, 3 B-2O3, and 3.5 H2O) [0021]
[Table 1]

No.	ポリホスフェート化合物	難燃性	熱変形温度
比較例		(秒)	(°C)
1-1	クレジルジフェニルホスフェート	消えない	68.6
1-2	トリクレジルホスフェート	消えない	71.0
1-3	トリフェニルホスフェート	消えない	69.7
1-4	フェニル・レゾルシン・ポリホス フェート (n=1.0) (硼酸亜鉛なし)	8 8	76.7
実施例			
1-1	フェニル・レゾルシン・ポリホス フェート (n=1.0)	5 2	82.6
1-2	フェニル・レゾルシン・ポリホス フェート (n=3.1)	5 4	81.9
1-3	フェニル・クレジル・レゾルシン ・ポリホスフェート (n=1.1)	5 4	80.6
1-4	フェニル・クレジル・レゾルシン ・ポリホスフェート (n=1.8)	5 0	81.2
1-5	フェニル・レゾルシン・ポリホス フェート (n=1.5)	4 7	82.8
1-6	フェニル・レゾルシン・ポリホス フェート (n=2.1)	5 8	82.6

[0022] [Example 2] After making the phenyl cresyl resorcinol poly phosphate (n= 1.8) 7 weight section and the zinc salt 5 weight section of the inorganic acid of a publication in [Table 2] into a pellet with an extrusion briquetting machine by the same actuation as an example 1 from bisphenol A which is number average molecular weight 25000 at the polycarbonate resin 93 weight section, the test piece was created with the injection molding machine.

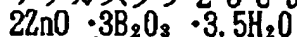
[0023] These five test pieces are used and it is JIS. The bleeding of an oxygen index and the surface state after taking out was observed by the method of examining a publication to K-7201. The result is shown in following [table 2].

[0024]

[Table 2]

No.	無機酸の亜鉛塩	酸素指数	ブリード
比較例 2-1	なし	23.2	激しい
2-2	ステアリン酸亜鉛	25.7	激しい
2-3	硼酸亜鉛 (ポリホスフェートなし)	26.7	ややあり
実施例 2-1	硼酸亜鉛* ¹	29.8	なし
2-2	スズ酸亜鉛* ²	28.9	なし
2-3	スズ酸亜鉛* ³	28.4	なし
2-4	炭酸亜鉛* ⁴	28.6	なし
2-5	けい酸亜鉛* ⁵	29.0	なし

*1 : アデカスタブ 2335 (旭電化工業製)



*2 : $\text{ZnSn}(\text{OH})_6$

*3 : ZnSnO_3

*4、*5 : 市販品

[0025] [Example 3] Pori (2, 6-dimethyl -1, 4-phenylene) ether 50 weight section, The rubber denaturation high-impact-polystyrene 50 weight section, the flame-retarder 10 weight section given in [Table 3], After mixing enough the tetrakis [methylene-3-(3', 5' - II tertiary butyl -4'-hydroxyphenyl) propionate] methane 0.5 weight section and the JITORIDE sill phenyl phosphite 0.5 weight section, It was made the pellet with the extrusion briquetting machine, and the test piece was further created at the molding temperature of 290 degrees C using the injection molding machine.

[0026] Under the present circumstances, observation by viewing of the volume of smoke outbreak in the nozzle section of an injection molding machine was performed. Subsequently, the bleeding of the surface state after holding this test piece for 15 minutes and taking it out at 200 degrees C was observed. Moreover, fire-resistant evaluation was performed like the example 1. The result is shown in following [table 3].

[0027]

[Table 3]

No.	難燃剤	難燃性	発煙量	ブリード
比較例 3-1	トリフェニルホスフェート	20 ^秒	著しく 多い	激しい
3-2	フェニル・レゾルシン・ポリホスフェート	15	少ない	なし
3-3	硼酸亜鉛	25	多い	ややあり
実施例 3-1	フェニル・レゾルシン・ポリホスフェート 硼酸亜鉛	3重量部 7重量部	28	ほとんど なし
3-2	フェニル・レゾルシン・ポリホスフェート 硼酸亜鉛	5重量部 5重量部	30	ほとんど なし
3-3	フェニル・レゾルシン・ポリホスフェート 硼酸亜鉛	7重量部 3重量部	32	ほとんど なし

[0028] Compared with the case where it is distinct to improve the fire retardancy of synthetic resin greatly as for the concomitant use with the resorcinol poly phosphate compound used for the synthetic-resin constituent of this invention from the result of each above-mentioned example, and the zinc salt of an inorganic acid, and it is used independently, respectively, it is clear that control the volume of smoke outbreak at the time of combustion it not only demonstrates the flameproofing effectiveness far, but, and bleeding hardly generates a surface state, either.

[0029]

[Effect of the Invention] The synthetic-resin constituent of this invention controls the volume of smoke outbreak at the time of combustion, and, moreover, it not only improves the fire retardancy of resin, but improves a dropping object.

[Translation done.]

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 95/03397

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